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CHA & REITER, LLC
210 ROUTE 4 EAST STE 103
PARAMUS, NJ 07652

EXAMINER	
KIM, DAVID S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/781,006	JUNG ET AL.
	Examiner	Art Unit
	David S. Kim	2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 06 August 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 and 5-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 and 5-18 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Applicant's response to the rejections of **claims 14-17** under 35 USC 112 in the previous Office Action (mailed on 06 April 2007) is noted and appreciated. Applicant responded by amending the claims, which overcomes the previous rejections.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Yamamoto et al.

4. **Claims 1, 4,9-13, and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (U.S. Patent No. 5,930,015, hereinafter "Yamamoto") in view of Lee et al. (U.S. Patent Application Publication No. US 2001/0004290 A1, hereinafter "Lee") with reference to Ramaswami et al. (*Optical Networks: A Practical Perspective*, hereinafter "Ramaswami").

Regarding claim 1, Yamamoto discloses:

A wavelength-division-multiplexed passive optical network comprising:

a central office (left side in Fig. 24)

a plurality of subscriber terminals (implied plurality of terminals on right side) for transmitting an upward signal using a reflected signal (signals reflect in amplifiers of Fig. 24, as shown by semiconductor laser amplifier in Fig. 2) of a multi-wavelength signal transmitted from the central office; and

a local office (221 in Fig. 24) disposed between the central office and the subscriber terminals via optical fibers for demultiplexing the multi-wavelength signal transmitted from the central office and for multiplexing signals from each of the subscriber terminals.

Yamamoto does not expressly disclose:

a central office ***in which a multi-wavelength lasing source is located, said multi-wavelength lasing source having a multiplexing/demultiplexing unit and a plurality of reflectors <u>comprised of mirrors</u> coupled to the multiplexing/demultiplexing unit <u>to reflect demultiplexed signals back to the multiplexing/demultiplexing unit</u>***.

Rather, Yamamoto discloses a plurality of wavelength lasing sources 61, 62, and 63 in Fig. 10. However, the practice of employing a central office with such a multi-wavelength lasing source is known in the art, as shown by the multi-channel WDM light source of Lee (Fig. 3, notice the (D)MUX and the F-P LDs, F-P LDs comprise reflectors). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to locate a multi-wavelength lasing source in the central office of Yamamoto. One of ordinary skill in the art would have been motivated to do this to replace the high cost of using a plurality of wavelength lasing sources in the central office (Lee, paragraph [0009], note the choice of incoherent light sources over expensive distributed feedback laser diodes for the concern of economical competitiveness).

<u>Examiner respectfully notes that prior art, Ramaswami, characterizes the reflecting surfaces of a Fabry-Perot cavity as mirrors (p. 167, 2nd full paragraph). Furthermore, Fig. 3 implies that light enters and exits from the same (left) side of an F-P LD. Therefore, as the mirror faces of the cavity reflect at least some of the light that enters the cavity, it follows that at least some of the demultiplexed light from the multiplexing/demultiplexing unit would be reflected back to the multiplexing/demultiplexing unit.</u>

Regarding claim 4, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 1, wherein the plurality of reflectors are mirrors (Lee, F-P LDs comprise reflectors that conventionally are mirrors).

Regarding claim 9, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 1, wherein the subscriber terminal includes a reflective optical amplification means (Yamamoto, semiconductor laser amplifier in Fig. 2).

Regarding claim 10, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 9, wherein the reflective optical amplification means is a reflective semiconductor optical amplifier (Yamamoto, semiconductor laser amplifier in Fig. 2).

Regarding claim 11, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 10, wherein the reflective semiconductor optical amplifier comprises an anti-reflection coating face formed on one side (Yamamoto, 47 in Fig. 5), a high-reflection coating face formed on another side (46), and a gain medium formed between the anti-reflection coating face and the high-reflection coating face (medium between 46 and 47), so that the semiconductor optical amplifier total-reflects a signal inputted through the anti-reflection coating face by the high-reflection coating face and outputs the total-reflected signal (output 36).

Regarding claim 12, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 11, wherein the semiconductor optical amplifier further amplifies and modulates the signal when the signal passes the gain medium (Yamamoto, col. 7, l. 55-62).

Regarding claim 13, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 9, wherein the subscriber terminal further comprises an optical distributor (Yamamoto, 224 in Fig. 24) and a broadcasting data optical receiver (Yamamoto, μ receiver) so as to receive a broadcasting service signal,

the optical distributor distributing downward signals inputted from the local office to the reflective optical amplification means and the broadcasting data optical receiver.

Regarding claim 18, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 9, wherein the subscriber terminal further comprises:

a broadcast reception optical receiver; and

an optical distributor (Yamamoto, 224 in Fig. 24) coupled to the reflective optical amplification means (Yamamoto, amplifier in Fig. 24), the broadcast reception optical receiver (Yamamoto, μ receiver) and the local office (221 in Fig. 24).

5. **Claims 2-3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of Lee, with reference to Ramaswami, as applied to the claims above, and further in view of Jung et al. ("Spectrum-sliced bidirectional WDM PON", hereinafter "Jung").

Regarding claim 2, Yamamoto in view of Lee, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 1, wherein the central office comprises:

a first optical amplifier for generating amplified spontaneous emission noise (Lee, paragraph [0061]);

the multiplexing/demultiplexing unit having

a first input/output terminal at a first side portion so as to receive the amplified spontaneous emission noise and to output a multi-wavelength lasing light (Lee, left side input/output terminal of (D)MUX in Fig. 3), and

a plurality of second input/output terminals for a multi-wavelength lasing light generation at the first side portion so as to output a multi-wavelength lasing light multiplexed in response to the input of the amplified spontaneous emission noise (Lee, right side input/output terminals of (D)MUX in Fig. 3);

the plurality of reflectors are coupled in one-to-one correspondence to the second input/output terminals at the second side portion of the multiplexing/demultiplexing unit, so as to input demultiplexed

signals outputted through the second input/output terminals back to the second input/output terminals (Lee, F-P LDs comprise reflectors); and

a circulator (Yamamoto, circulator in Fig. 24) for outputting a multi-wavelength lasing light inputted from the multiplexing/demultiplexing unit to the local office (Yamamoto, 221 in Fig. 24) and transmitting an upward signal inputted from the local office to the upward signal input terminal of another multiplexing/demultiplexing unit (Yamamoto, 2nd optical coupler-splitter in Fig. 24).

Yamamoto in view of Lee, with reference to Ramaswami, does not expressly disclose:

the multiplexing/demultiplexing unit having

a first input/output terminal ***and a plurality of upward signal output terminals at a first side portion*** so as to receive the amplified spontaneous emission noise and to output a multi-wavelength lasing light, and

a plurality of second input/output terminals ***and an upward signal input terminal*** for a multi-wavelength lasing light generation at the first side portion so as to output a multi-wavelength lasing light multiplexed in response to the input of the amplified spontaneous emission noise ***and to demultiplex and to output the upward signal in response to the input of the upward signal***;

a plurality of upward signal receivers coupled to the upward signal output terminals at the first side portion of the multiplexing/demultiplexing device in one-to-one correspondence;

a circulator for outputting a multi-wavelength lasing light inputted from the multiplexing/demultiplexing unit to the local office and transmitting an upward signal inputted from the local office to the upward signal input terminal of ***the*** multiplexing/demultiplexing unit.

The limitations highlighted above correspond to the particular bi-directional use of multiplexing/demultiplexing device 650 and 650a in Applicant's Figs. 3-4. This particular bi-directional use of a multiplexing/demultiplexing device is known in the art, as shown by Jung (MUX/DEMUX in Fig.

2). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to employ this particular bi-directional use of a multiplexing/demultiplexing device in the apparatus of Yamamoto in view of Lee, with reference to Ramaswami. One of ordinary skill in the art would have been motivated to do this to economically use only one multiplexing/demultiplexing device (Jung, p. 160, 1st paragraph, "only one waveguide grating router") instead of the two shown in Fig. 24 of Yamamoto.

Regarding claim 3, Yamamoto in view of Lee and Jung, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 2, wherein the multiplexing/demultiplexing unit is an NxN waveguide grating router (Jung, WGR of Fig. 2).

6. **Claims 5-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of Lee and Jung, with reference to Ramaswami, as applied to the claims above, and further in view of Iannone et al. (U.S. Patent No. 6,147,784, hereinafter "Iannone").

Regarding claim 5, Yamamoto in view of Lee and Jung, with reference to Ramaswami, does not expressly disclose:

A wavelength-division-multiplexed passive optical network as claimed in claim 2, wherein the central office further comprises an external modulator for modulating a multi-wavelength lasing light outputted from the multiplexing/demultiplexing unit on the basis of predetermined broadcasting service signals and for outputting the modulated signal to the circulator.

However, such an external modulator is known in the art, as shown by Iannone (shared gain section 23 in Figs. 1-2). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to provide such an external modulator in the apparatus of Yamamoto in view of Lee and Jung, with reference to Ramaswami, to modulate the multi-wavelength lasing light outputted from the multiplexing/demultiplexing unit on the basis of predetermined broadcasting service signals and for outputting the modulated signal to the circulator. One of ordinary skill in the art would have been motivated to do this since it provides the benefit of providing broadcast signals without requiring an additional light source (Iannone, col. 2, l. 5-8).

Regarding claim 6-8, Yamamoto in view of Lee, Jung, and Iannone, with reference to Ramaswami, does not expressly disclose:

(claim 6) A wavelength-division-multiplexed passive optical network as claimed in claim 5, wherein the external modulator is a LiNbO.sub.3 modulator.

(claim 7) A wavelength-division-multiplexed passive optical network as claimed in claim 5, wherein the external modulator is an electro-absorption modulator.

(claim 8) A wavelength-division-multiplexed passive optical network as claimed in claim 5, wherein the external modulator is a semiconductor optical amplifier.

However, all three of these devices are conventional types of external modulators. Thus, employing any of them in the apparatus of Yamamoto in view of Lee, Jung, and Iannone, with reference to Ramaswami, would only provide additional obvious variations.

7. **Claims 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of Lee and Jung, with reference to Ramaswami, as applied to the claims above, and further in view of Ramaswami et al. (*Optical Networks: A Practical Perspective, 2nd ed.*, hereinafter "Ramaswami").

Regarding claim 14, Yamamoto in view of Lee and Jung, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 1, wherein the lasing source comprises:

a circulator (Lee, CIR in Fig. 3);

a first optical amplifier coupled to the circulator (Lee, ILS as an optical fiber amplifier in paragraph [0061]);

a multiplexer/demultiplexer device coupled to the circulator (Lee, (D)MUX in Fig. 3);

a plurality of mirrors coupled to the multiplexer/demultiplexer device (Lee, F-P LDs in Fig. 3 comprise reflectors that conventionally are mirrors); and

a filter coupled to the circulator (Lee, BPF in Fig. 3).

Yamamoto in view of Lee and Jung, with reference to Ramaswami, does not expressly disclose:

a laser diode;

a first and second optical distributor;

a first optical amplifier coupled to the circulator *and first and second optical distributor;*

a filter coupled to the circulator *and a second optical amplifier.*

However, notice that the first optical amplifier of Yamamoto in view of Lee and Jung, with reference to Ramaswami, is an optical fiber amplifier (Lee, paragraph [0061]). Such optical amplifiers conventionally comprise a laser diode and optical distributors, as shown by Ramaswami (e.g., Fig. 3.34 and Fig. 3.37). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to include such conventional components in the optical fiber amplifier of Yamamoto in view of Lee and Jung, with reference to Ramaswami. One of ordinary skill in the art would have been motivated to do this to provide the proper pump signal so that the optical fiber amplifier has the proper energy to operate (Ramaswami, p. 153, 1st full paragraph).

Additionally, note that optical amplifiers are common devices in optical communication systems (Ramaswami, p. 151, 1st two full paragraphs). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to include a second optical amplifier in the lasing source of Yamamoto in view of Lee and Jung, with reference to Ramaswami, to amplify the signal output from the lasing source (Lee, output of Fig. 3). One of ordinary skill in the art would have been motivated to do this to compensate for loss (Ramaswami, p. 151, 1st full paragraph) in the apparatus of Yamamoto in view of Lee and Jung, with reference to Ramaswami. Also, it is an obvious variation to employ the filter (Lee, BPF in Fig. 3) of Yamamoto in view of Lee and Jung, with reference to Ramaswami, in the output arm of Fig. 3 since the filter would provide the same substantial function in either arm of the circulator (Lee, CIR in Fig. 3). Accordingly, Yamamoto in view of Lee, Jung, and Ramaswami, with reference to Ramaswami, would disclose the filter coupled to the circulator *and a second optical amplifier.*

Regarding claim 15, Yamamoto in view of Lee, Jung, and Ramaswami, with reference to Ramaswami, discloses:

A wavelength-division-multiplexed passive optical network as claimed in claim 14, wherein the lasing source further comprises an upward data receiver (Jung, Rx units in Fig. 2) coupled to the multiplexer/demultiplexer device.

Response to Arguments

8. Applicant's arguments have been fully considered but they are not persuasive. Applicant's present arguments were originally filed on 05 July 2007. Examiner responded to these arguments in an Advisory Action mailed on 31 July 2007. Applicant subsequently filed a Request for Continued Examination (RCE) on 06 August 2007. However, no further arguments are presented with this RCE. Moreover, Applicant has not addressed Examiner's response from the Advisory Action. Accordingly, Examiner re-presents the response from the Advisory Action mailed on 31 July 2007 below:

Applicant's arguments (filed on 05 July 2007) have been fully considered but are not persuasive. Applicant states,

"Applicant respectfully disagrees that a series of Fabry-Perot Laser Diodes that receive an individual demultiplexed output are 'a plurality of reflectors comprised of mirrors' as recited in claim 1.

First of all, while a Fabry-Perot Laser Diode has two reflecting surfaces inside a cavity, the reflecting surfaces face each other so as to reflect light back and forth, and one or both transmit a fraction of the resonant frequency. The resonance is created by making the distance of one round trip between reflective surfaces equal to an integral number of wavelengths of the Cavity material. The reflection back and forth creates constructive interference if the reflections are in phase, or destructive interference occurs if the reflections are not in phase. In any event, the FPLD shown in Lee does not reflect the light back to the demultiplexer shown in Fig. 3 of Lee, nor is the demultiplexer a multiplexing/demultiplexing unit as recited in claim 1" (REMARKS, p. 8, 1st and 2nd full paragraphs).

Examiner respectfully notes that prior art, Ramaswami et al. (Optical Networks: A Practical Perspective, 2nd ed., hereinafter "Ramaswami"), characterizes the reflecting surfaces of a Fabry-Perot cavity as

mirrors (p. 167, 2nd full paragraph). Furthermore, Fig. 3 implies that light enters and exits from the same (left) side of an F-P LD. Therefore, as the mirror faces of the cavity reflect at least some of the light that enters the cavity, it follows that at least some of the demultiplexed light from the multiplexing/demultiplexing unit would be reflected back to the multiplexing/demultiplexing unit. Accordingly, Applicant's arguments are not persuasive, and Examiner respectfully maintains the standing rejections.

Allowable Subject Matter

9. **Claims 16-17** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth N. Vanderpuye can be reached on 571-272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSK

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER